

1 CLAIMS

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3 1. A method of decomposition of waveforms in a
4 cardiac signal using wavelet transform analysis.

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6 2. A method as claimed in Claim 1 comprising the step
7 of employing discretized wavelet transform
8 analysis to process the said waveform.

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10 3. A method as claimed in Claim 1 comprising the step
11 of employing discretized continuous wavelet
12 transform analysis to process the cardiac
13 waveform.

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15 4. A method as claimed in any preceding claim
16 comprising the steps of deriving the wavelet
17 energy surfaces of an electrocardiogram (EKG)
18 signal; and plotting said wavelet energy surfaces
19 against a location parameter b , and a scale
20 parameter.

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22 5. A method as claimed in Claim 4 wherein said scale
23 parameter is dilation a .

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25 6. A method as claimed in Claim 4 wherein said scale
26 parameter is band pass frequency f_{bpc} .

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28 7. A method as claimed in any preceding claim
29 comprising the initial steps of connecting
30 electrodes to a presenting patient; and sampling
31 the analogue input signals recorded to derive the
32 cardiac signal.

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- 1 8. A method as claimed in any preceding claim
2 including visually displaying the cardiac signal.
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- 4 9. A method as claimed in any preceding claim
5 including visually displaying the distribution of
6 energies within the cardiac signal.
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- 8 10. A method as claimed in any preceding claim
9 including visually displaying coherent structures
10 within the cardiac signal.
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- 12 11. A method as claimed in any preceding claim
13 including visually displaying the signal in real-
14 time for clinical use.
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- 16 12. A method as claimed in any preceding claim
17 comprising the step of constructing a contour plot
18 to display the decomposed waveform obtained.
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- 20 13. A method as claimed in any preceding claim
21 comprising the step of constructing a surface plot
22 to display the decomposed waveform obtained.
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- 24 14. A method as claimed in any preceding claim
25 comprising the step of constructing a 2D or a 3D
26 energy scalogram to display the decomposed
27 waveform obtained.
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- 29 15. A method as claimed in any preceding claim
30 including the step of disassociating the component
31 features of the temporal trace of a recorded EKG.
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- 1 16. A method for the analysis of an EKG of a heart in
2 ventricular fibrillation including the method as
3 claimed in any preceding claim.
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- 5 17. A method for the analysis of an EKG of a heart in
6 ventricular fibrillation after the commencement of
7 cardio-pulmonary resuscitation (CPR) including the
8 method as claimed in any of Claims 1 to 15.
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- 10 18. A method as claimed in Claim 17 including the step
11 of temporal filtering of the EKG signal of a heart
12 that is subject to CPR to disassociate the CPR
13 signal from the heart signal.
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- 15 19. A method as claimed in Claim 17 or Claim 18 using
16 wavelet *energy scalograms*.
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- 18 20. A method as claimed in Claim 17 or Claim 18 using
19 ridge following techniques
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- 21 21. A method as claimed in Claim 20 wherein said ridge
22 following techniques are modulus maxima
23 techniques.
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- 25 22. A method for the estimation of the health of a
26 heart in VF including the method of any of Claims
27 1 to 15 to provide measurable characteristics.
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- 29 23. A method as claimed in Claim 22 wherein said
30 measurable characteristics are used to provide an
31 estimate of the time elapsed since the onset of a
32 cardiac incident.

- 1 24. A method as claimed in Claim 22 wherein said
2 measurable characteristics are used to provide an
3 estimate of the health of a heart after
4 commencement of CPR.
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- 6 25. A method as claimed in any of Claims 22 to 24
7 wherein said measurable characteristics are used
8 to predict the outcome of a given therapeutic
9 intervention.
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- 11 26. A method as claimed in any of Claims 22 to 25
12 wherein said measurable characteristics are used
13 to provide a guide for the optimal timing of
14 defibrillation of a heart in VF.
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- 16 27. A method for the analysis of an EKG of a heart in
17 atrial fibrillation including the method as
18 claimed in any of Claims 1 to 14.
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- 20 28. A method as claimed in Claim 27 including the step
21 of partitioning the signal to provide separate
22 traces of QRS and T waves, and/or atrial activity
23 and/or background noise.
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- 25 29. A method as claimed in any preceding claim
26 including the step of constructing a damage index
27 for reference purposes.
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- 29 30. A method as claimed in Claim 29 wherein
30 construction of said index includes the step of
31 developing network classifier from a library of
32 recorded data.

- 1 31. A method as claimed in Claim 30 wherein said
2 network classifier developed is a neural network.
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- 4 32. A method as claimed in any of Claims 29 to 31
5 wherein said network classifier developed is a
6 wavelet network classifier.
7
- 8 33. A method of decomposition of cardiac waveforms
9 using matching pursuit algorithms.
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- 11 34. Apparatus for decomposition of waveforms in a
12 cardiac signal, said apparatus comprising wavelet
13 transform analysis means.
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- 15 35. Apparatus as claimed in Claim 34 including means
16 to display the distribution of energies within a
17 waveform.
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- 19 36. Apparatus as claimed in Claim 34 or Claim 35
20 including a monitor adapted to display decomposed
21 waveforms.
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- 23 37. Apparatus as claimed any of Claims 34 to 36
24 adapted for inclusion in an EKG apparatus.
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- 26 38. Defibrillation means adapted to operate in
27 response to a signal generated by comparison of an
28 EKG trace with decomposed waveform obtained by the
29 method of any of Claims 1 to 33.
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5 40. Apparatus as described in any of Claims 34 to 38
6 with reference to or as shown in the accompanying
7 drawings.

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